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(54) Water display apparatus

(57) Water display apparatus includes a bowl (4) for collecting water which spills from a rotatable water display device (8), the device being mounted on a stationary shaft (30) inclined to the vertical. The display device (8) has a helical arrangement (10) having a plurality of concave portions (12). A pump located in a water container below the bowl discharges water onto the top of the helical arrangement. A halogen lamp for illuminating the display device (8) through a multi-coloured disc (36) is provided at the base of the bowl. In case water supplied to the top part of the display device (8) runs down the helical arrangement (10) causing it to rotate.

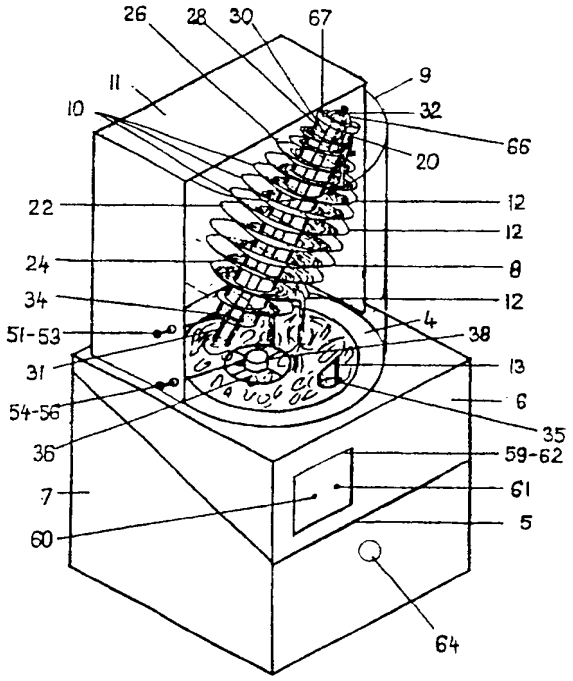

FIGURE 1

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

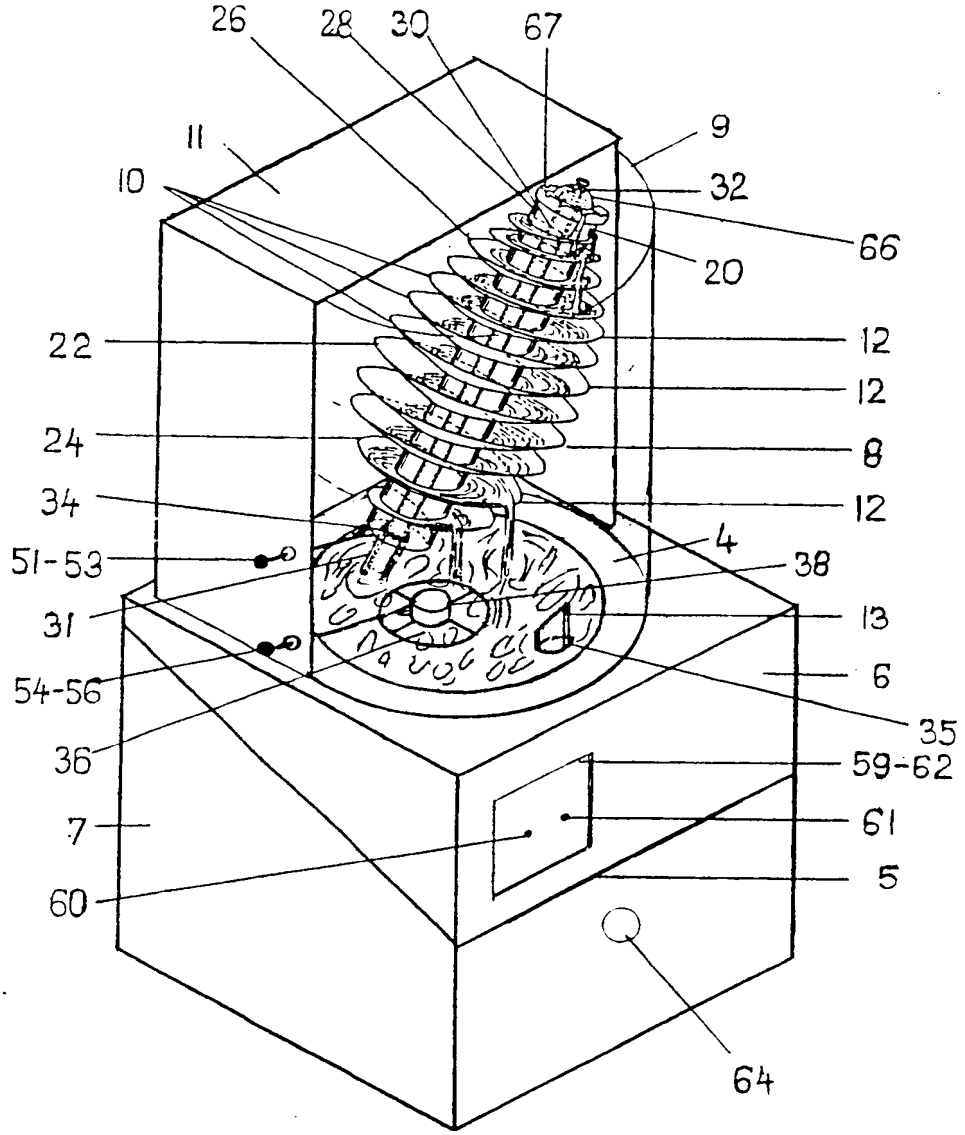
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FIGURE 1

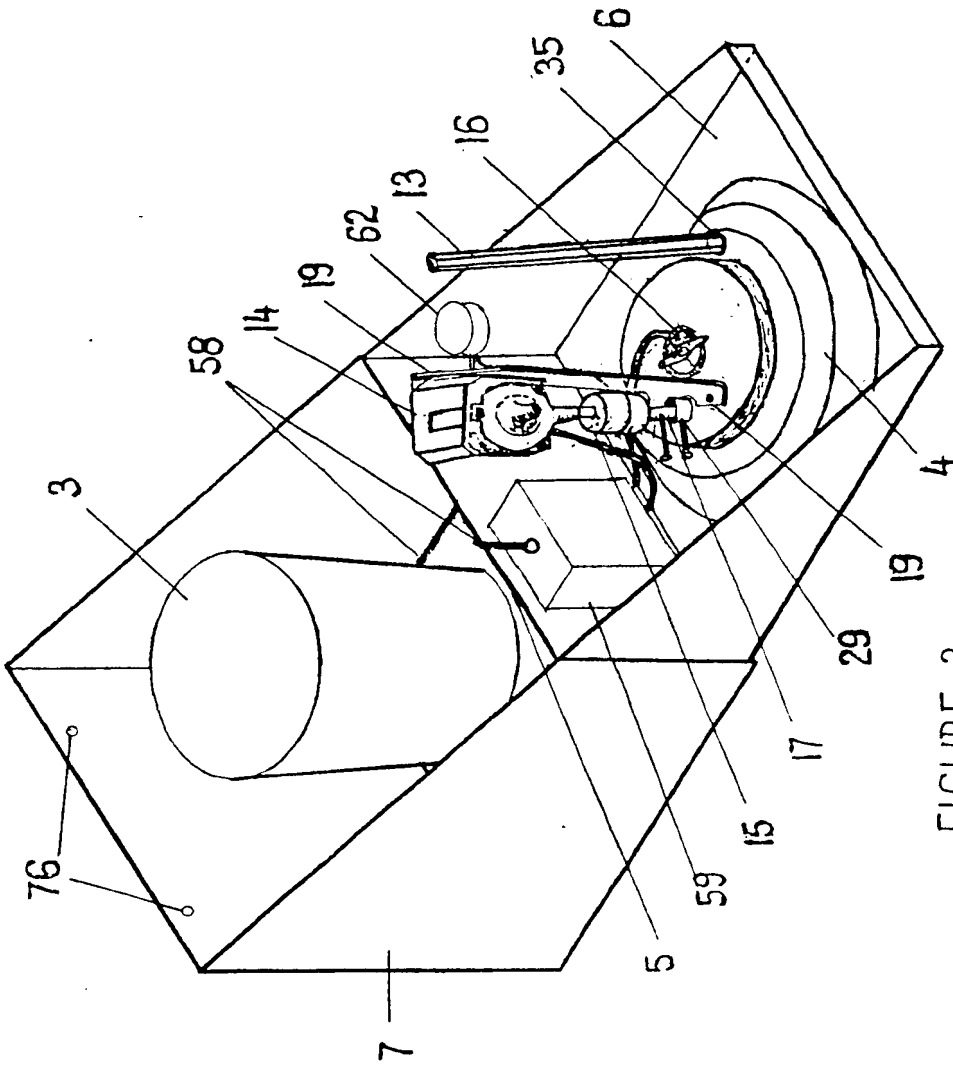

FIGURE 2

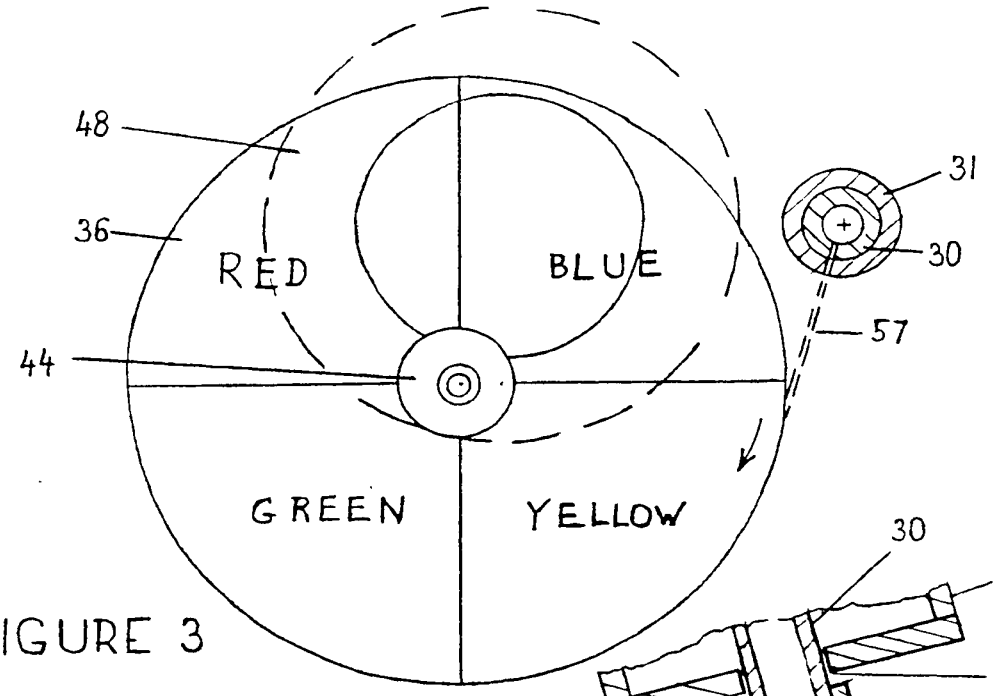

FIGURE 3

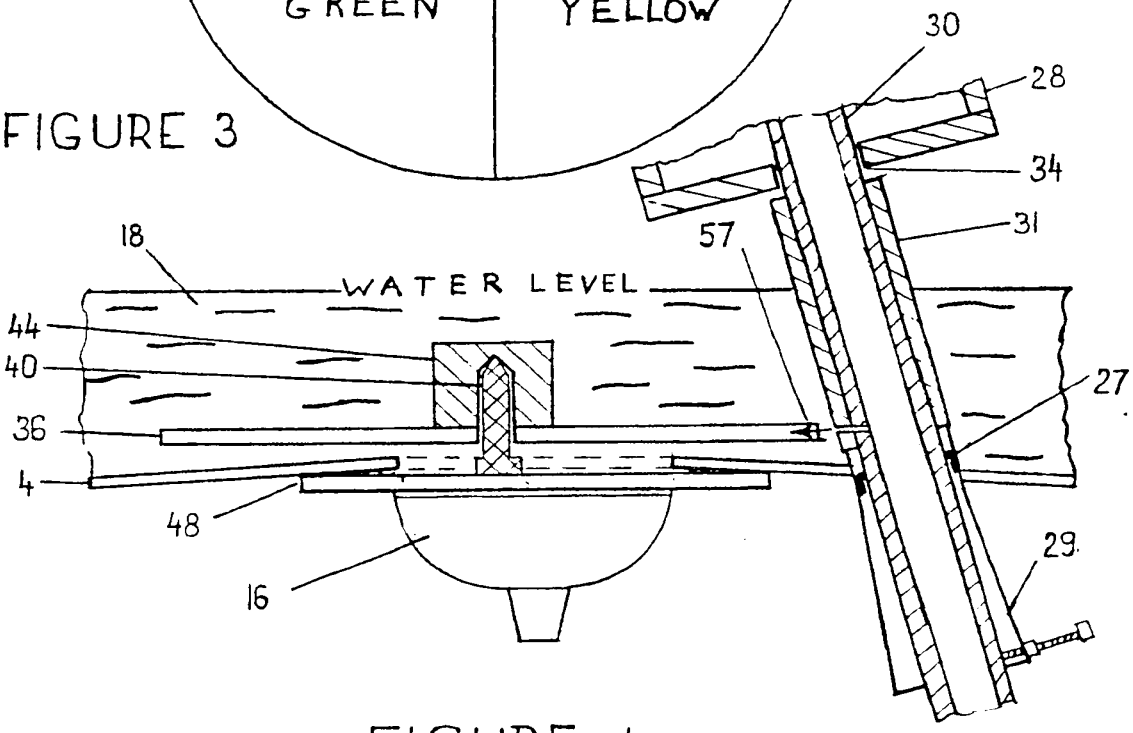

FIGURE 4

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WATER DISPLAY APPARATUS

This invention relates to water display apparatus which may also act as a visual stimulant for persons suffering from sensory impairment and as an air humidifier for rooms.

There are many different types of aesthetically pleasing displays including static sculptures, water displays with fountains, and fish tanks. Of the many available different types of displays, those displays that utilise water are often regarded as providing a good combination of aesthetic appeal combined with a soothing quality. It is known to have water displays both indoors and outdoors but often indoor displays with running water are restricted to large displays in airports and atria of prestigeous buildings.

There is a need for water display apparatus with running water which is able to be cited both indoors and outdoors and which when cited indoors is able to be cited substantially where desired without the need for constructing a large purpose-built area.

There is a further need for a water display apparatus with moving surfaces over which the water flows which are illuminated in colours which continually change. This need is particularly felt as a visual stimulant for persons and patients who suffer from sensory impairment.

There is also a need for apparatus to increase the relative humidity of the air in rooms when the natural air humidity of the air is below the minimum level, (about 35%) needed for human health and comfort. An air humidifier which has visual and audile appeal has obvious advantages.

According to the present invention there is provided water display apparatus comprising one or two containers for water and a rotatable water display device which is mounted on a stationary shaft which is inclined to the vertical, the display device being such that it extends

upwardly from the bowl at an angle to the vertical, the display device comprising a helical arrangement having a plurality of concave portions, pump means and illumination means for illuminating the display device, the water display apparatus being such that in use the pump means pumps water to the top part of the display device from where the water is able to run down the helical arrangement, and the water display is such that in use the display device is caused to rotate by the water running down the helical arrangement.

When a single water container is used it is referred to as the bowl and where two water containers are used the upper one is referred to as the bowl and the lower one is referred to as the reservoir.

The purpose of the second container or reservoir is to reduce the frequency by which water needs to be added to the water display apparatus to replace evaporation losses. When a water reservoir is used the bowl is provided with a weir tube which controls the water level in the bowl. In operation water flows down through the weir tube into the reservoir below while the pump means pumps water from the reservoir to the top of the display device. The display device may be simply placed on the shaft and slid into its operating position and as easily removed.

When a water reservoir is used, the pump may be one designed to run fully submerged in water. The pump may be fixed to a bracket attached to the underside of the bowl so that it is held inside and near to the bottom of the reservoir. A suitable filter may be placed on the suction or delivery side of the pump to remove adventitious solids from the water.

The water running down the helical arrangement may cause the display device to rotate at, for example 8-60 revolutions per minute. By incorporating a braking device, the display device can be caused to rotate over a wide range of speeds.

Preferably the helical arrangement is a helical fin arrangement. The fins are preferably thin fins. The fins are preferably transparent.

Preferably the helical arrangement tapers from a central portion towards both of its ends. With such a construction, water cascades over the concave portions at both ends of the helical arrangement. The cascading water helps to enhance the appeal of the water display apparatus since the cascading water sounds pleasant.

The concave portions are preferably shallow concave portions. Such concave portions are saucer-like in apparance.

Preferably the concave portions are continuous to form a continuous water path down the helical arrangement. Alternately, if desired, the concave portions may be apertured to form an interupted water path down the helical arrangement. In this case the water is able to run down the helical path and also through the apparatus.

The display device may be inclined with its central axis at an angle of 10-45° to the vertical. Preferably the display device is inclined with its central axis at an angle of 12-20° to the vertical.

The water display apparatus may be one in which the display device includes a rotatable cylinder from which the helical arrangement extends, a non-rotatable shaft which is mounted in the base of the bowl and which extends through the bowl and through the cylinder, and bearing means for mounting the cylinder on the shaft such that the cylinder and display device of which it forms a part are free to rotate. The cylinder is preferably closed at its lower end by a disc with a central hole of slightly larger diameter than that of the stationary shaft.

The water display apparatus may be one in which the shaft is a hollow supporting shaft through which the water from the bowl or the reservoir is pumped to the top part of the display device.

Preferably, the non-rotatable shaft is transparent but it may be non-transparent if desired.

The shaft may be permanently fixed at an appropriate angle and position and sealed to the base of the bowl or it may be free to slide through a hole or circular channel in the base of the bowl. In this case a sealing means is needed for forming a seal between the shaft and the

hole or channel to prevent water from passing through the gap between them. The sealing means is preferably an 'O' ring seal but other types of sealing means may be employed if desired.

As the angle of the shaft to the vertical is quite critical, it is useful to have a means for occasionally adjusting the angle of the shaft to the vertical after the water display apparatus has been installed in order to produce the optimum display without splashing. This may be achieved by the use of a specially shaped pipe fitting in the base of the bowl through which the shaft passes. The pipe fitting has a circular cross section at the top where the sealing means is provided. This cross section becomes increasingly elongated towards its lower end, where it has parallel sides which terminate in half circles between which the shaft can slide and tilt. This special pipe fitting is provided with a simple screw mechanism which holds the shaft at the desired angle to the vertical.

This specially shaped pipe fitting with its screw mechanism is subsequently referred to as the angle adjuster.

In cases where a seal is provided which allows the shaft to slide through it, some means must be provided to prevent the shaft from sliding down through the seal under the weight of the display device and the moving water on it. One preferred means is by the use of a short tightly fitting spacer collar round the shaft and fixed to it. The lower end of the spacer collar then rests on the top of the angle adjuster which is fixed and sealed into the bowl. The top of the spacer-collar preferably terminates at some point below the cylinder of the water display device.

The bearing means may comprise a point bearing attached to the upper end portion of the shaft, and a bush bearing at the lower end portion of the shaft. The point bearing acts as a thrust bearing and carries the weight of the water display device and the water on it. The bush bearing acts mainly as a radial bearing. Other types of bearing means may be employed.

When a point bearing is used at the upper end of the shaft, means will normally be provided for the water leaving the top of the stationary shaft to pass to the outside of the top of

the rotating cylinder which forms part of the display device. This generally requires the water to leave the top of the stationary shaft through one or more nozzles as jets which strike against the inside of the top of the rotating cylinder. These nozzles are conveniently incorporated as a single piece in the point bearing. This combined nozzle-point bearing may conveniently be threaded on the outside and screwed into the top of the hollow shaft which is also threaded.

The top of the rotating cylinder is then provided with means such as an internal annular lip for preventing the water from simply running down the inside of the cylinder. Instead the water is constrained to pass over the top of the cylinder onto the helical fin arrangement.

The illumination means may comprise a light source plus a plurality of differently coloured light filters. There may be four of the differently coloured filters. More or less than four differently coloured filters may be employed. Any suitable and appropriate colours or combination of colours may be employed.

The differently coloured filters are preferably incorporated in a circular multi-colour disc each in a separate area of the disc.

Preferably the multi-colour disc is so arranged that it is free to rotate underwater in a horizontal plane during use of the water display apparatus.

Various means may be used to cause the multi-colour disc to rotate. The preferred means of rotation is by a submerged jet of water so directed as to impinge tangentially on the outer edge of the multi-colour disc. The preferred source of the submerged water jet is a small radial hole drilled through the wall of the hollow shaft and spacer collar to which it is attached. The orientation of the jet may be adjusted by turning the shaft and spacer collar slightly in the angle adjuster.

The multi-colour disc may be supported at its centre by a point bearing supported by a short vertical rod fixed to the base of the bowl.

The point on the bowl where the bush bearing or vertical rod is fixed to the bowl is preferably not directly above the centre of the light source but sufficiently to one side of it so that as the multi-colour disc rotates, the light shines through differently coloured areas of the disc in turn.

Alternatively the multi-colour disc is may be fixed at its centre to a vertical spindle, the lower end of which is free to rotate in a bush bearing mounted on the base of the bowl.

Preferably a light source of the illumination means is mounted below the bowl and shines upward onto the water display device through a transparent window sealed in the base of the bowl.

The light source should shine through a narrow angle so that most of the light is directed onto the water display device.

If desired a lens or any other suitable and appropriate arrangement may be employed for concentrating the light and focussing it on any desired point or points.

The multi-colour disk (of the illumination means) is preferably mounted in the bowl so as to be below the water level in the bowl during use of the water display apparatus. Alternatively the multi-colour may be so mounted as to float on the water in the bowl durng use of the water display apparatus.

The water display device may be provided with brake means to limit and control the speeds of rotation both of the water display device and of the multi-colour disc. If desired the brake means may be used to completely stop the rotation of the water display device or of the multi colour disc. Different visual and audible effects may be obtained by varying the rotational speeds of the display device and of the multi-colour disc.

Preferably the brake means is a friction device and a friction control member. The friction device may be a stationary fibre bundle brushing against a rotating part or it may be a rubber 'O' ring. The friction control member may be a screw device.

The water display apparatus of the present invention may be made from any suitable and appropriate material. It is presently preferred to make the bowl and the helical arrangement from plastic materials. Metallic and ceramic materials may nowever be employed if desired.

The water display apparatus may advantageously include automatic water make-up means to replace water lost through evaporation and the like. This is important when the water display device functions primarily as an air humidifier and when the relative humidity of the surrounding air is low. The automatic make-up means may comprise a water reservoir below the bowl as described earlier and a constant level device in the bowl consisting of the adjustable weir tube described earlier.

The water display device may be conveniently filled with water by pouring it into the bowl. The water level in the water reservoir needs to be visible when water is being added and an overflow tube is advisable. A low water level trip-switch in the reservoir to cut off electricity to the pump and light is desirable to protect the water display apparatus when the water level falls to a critical level .The water used should be clean, and unless it is soft, it may need to be treated with a suitable chemical to prevent the deposition of lime scale during operation. It is also advisable to add a small quantity of an appropriate biocide to prevent the growth of algae and other micro-organisms in the apparatus. The addition of about 25 parts per million of hydrogen peroxide to the make-up water is recomended.

The water display apparatus may have a base, a purpose-made stand or cabinet for floor, wall or corner mounting. The rotating water-display device may have a protective transparent shield which is secured to the base or cabinet. The base may be integral with the water reservoir. One preferred type of cabinet has a hinged lid into which the bowl, pump and pump bracket, light source and its transformer and all electrical control gear are fixed while the water reservoir is in the lower stationary part of the box.

This has several important advantages:

1) It enables all electrical parts of the water display apparatus to be permanently wired and fixed when it is made so that little assembly is needed on site.

2) The box can be designed so that everything can be packed inside it ready for despatch.

3) The water reservoir (e.g. a bucket) and all unsightly wiring are completely hidden.

4) It greatly facilitates the occasional maintenance needed such as changing the light bulb or water filter.

Embodiments of the invention will now be decribed solely by way of example and with reference to the accompanying drawings in which:

Figure 1 is an isometric view of the water display apparatus in a purpose built cabinet with a hinged lid and a transparent shield;

Figure 2 is an isometric view of the same water display apparatus shown in Figure 1, with the shield removed and the lid opened through 180° (as for maintenance) and showing the parts under the bowl and lid and the water reservoir;

Figure 3 is a plan the rotatable multi-colour disc showing the water jet which turns the multi-colour disc; and

Figure 4 is a vertical cross-section of the rotatable multi-colour disc and the lower part of the shaft and angle adjuster.

Referring to Figures 1 to 4, there is shown water display apparatus 2 comprising water 18, a bowl 4 for water, a water reservoir 3 and a rotatable display device 8. The bowl 4 is sealed into a hinged lid 6 of a cabinet 7 to which it is joined by hinge a 5. The rotatable display device 8 extends upward from the bowl 4 at an angle to the vertical as can best be seen from Figure 1. It may be covered for protection, as required, by a transparent screen 9 which is attached to a case 11. Both the transparent screen 9 and the case 11 may be fastened to the lid 6 of the cabinet 7.

The display device 8 comprises a helical arrangement 10 having a plurality of concave portions 12. The display apparatus 2 also comprises pump means in the form of a pump 14 and an illuminating means comprising a light source 16 and a transparent multi-colour disc 36 which are best seen in Figures 3 and 4.

As will be explained in more detail hereinbelow, the pump 14 operates during use of the water display apparatus 2 to pump water from the reservoir 3 in which it is submerged during operation to a top part 20 of the display device 8, from where the water is able to run down the helical arrangement 10 and into the bowl 4 from which it returns via a weir tube 13 to the reservoir 3 below.

As the water runs down the helical arrangement 10, it causes the display device 8 to rotate. The display device 8 may rotate at 8-60 revolutions per minute.

As can be seen from Figure 1, the helical arrangement 10 is a helical fin arrangement. The helical fin arrangement tapers from a central portion 22 towards both its ends 24, 26. The concave portions 12 are preferably continuous so that they form a continuous water path down the helical arrangement 10.

The display device 8 is such that it has its central axis inclined at an angle of approximately 15° to the vertical.

The display device 8 includes a rotatable cylinder 28 from which the helical arrangement extends. The display device further includes a non-rotatable hollow shaft 30. The lower end of shaft 30 passes through a screw-operated angle adjuster 29 which in turn passes through and is sealed into the base of the bowl 4. Sealing means in the form of an O-ring seal 27 prevents water leaking between the shaft 30 and the angle adjuster 29.

To prevent the shaft 30 from sliding down through the O-ring seal 27, a spacer-collar 31 is sealed around the shaft 30. The spacer-collar 31 is supported by the top edge of the angle adjuster 29. The hollow supporting shaft 30 extends through and along the rotatable cylinder 28. The display device still further comprises bearing means in the form of a point

bearing 32 and a bush bearing 34. The point bearing 32 and the bush bearing 34 mount the rotatable cylinder 28 on the hollow supporting shaft 30 such that the rotatable cylinder 28 and the display device 8 are free to rotate under the action of the descending water.

As is best seen from Figures 1, 3 and 4, the illumination means comprises a rotatable transparent multi-colour disc 36 which is mounted just above the bowl and an upwardly pointing light source 16 which is mounted under a window in the floor of the bowl 4.

The multi-colour disc 36 may consist of four quadrants coloured blue, red, green and yellow and a boss 44 at its centre. The multi-colour disc 36 has a hole at its centre by which the multi-colour disc 36 is supported on the tip of a pin 40 so that the disc 36 is free to rotate in a horizontal plane.

The window may consist of a glass disc 48 which covers an aperture in the floor of the bowl 4 to which it is sealed. The head of the pin 40 which is inverted is fixed to the floor of the bowl 4 in a position where it is just outside the aperture in the bowl 4 which is covered by the glass disc 48. The diameter of the multi-colour disc 36 is preferably at least twice that of the aperture in the floor of the bowl 4 so that each coloured area of the multi-colour disc 36 is exposed in turn to the light passing through the window.

As shown in Figure 4, the multi-colour disc 36 lies below the level of the water 18 in the bowl 4, but it can also be arranged to float on the water with a buoyancy ring attached to it or it can be arranged to rotate above the water level.

Figures 3 and 4 shows a water jet 57 which causes the multi-colour disc 36 to rotate. A jet 57 results from a small hole drilled in the appropriate position through the wall of the shaft 30 and the spacer collar 31. The direction of the jet 57 can be adjusted by turning the shaft 30 and spacer collar 31 so that it strikes the edge of the multi-colour disc 36 tangentially to impart optimum rotational effect. This causes a very attractive constantly changing coloured display to occur.

The angle of rotation of the display device 8 and the shape of the concave portions 12 are such that as water runs down the display device 8, pools of water form in the concave portions 12 on the right side of the concave portions 12 as viewed in Figure 1. The bearings 32, 34 enable the display device 8 to be mounted with little friction, and so the weight of the pools of water causes the display device 8 to rotate as the pools of water move over and down the helical arrangement 10, before falling into the bowl 4. The concave portions 12 are preferably made of a transparent plastics material which gives a pleasing aesthetic effect during use of the water display apparatus 2.

The pump 14 is held by a bracket 19 which is attached to the underside of the bowl 4.

If required the water leaving the pump 14 may be arranged to pass first through a water filter 15 and a control valve 17.

The top of the weir tube 13 through which the water leaves the bowl 4 is cut at an acute angle. The weir tube 13 passes through a flexible grommet 35 in the floor of the bowl 4 so that the weir-tube 13 can be slid up or down in the grommet 35. By this means the water level in the bowl 4 can be altered at will and the water in the bowl 4 can be drained into the reservoir 3 ,

The hollow supporting shaft 30 is secured in mounting means in the form of the angle adjuster 29. The angle adjuster 29 enables the angle of inclination of the shaft 30 and therefore the entire display device 8 to be varied. A screw enables the setting of the precise angle of the hollow supporting shaft 30. The precise angle of the display device 8 controls the width of the pools of water formed on the concave portions 12, and also the sound of the water cascading from the ends. The bowl 4 can be provided in a variety of colours including terracotta, mottled stone, speckled white and dark green.

The water pumped up the hollow supporting shaft 30 emerges at the top part 20 as jets. These jets strike the inside of a dome 66 before passing through slots 67 and then on to the helical arrangement 10. The water 18 lubricates the point bearing 32.

The bush bearing 34 is preferably a polytetrafluorcethylene bush bearing 34. The bush bearing 34 may be housed in a disc. The bush bearing 34 acts as a radial bearing, whereas the point bearing 32 acts as a thrust bearing.

Figure 1 shows arrangements for braking the rotational speeds of the display device 8 and of the multi-colour disc 36. Each employs a brush or fibre bundle bearing on a rotating part as the friction device. In each case the friction device is attached to a screw-device which enables the fibre bundle to be advanced against or retracted from the rotating part. The screw-device may consist of a threaded rod with a knob at one end by which to turn it. The threaded rod engages in a nut fixed to a suitable stationary part of the water display apparatus 2.

In Figure 1 the rotatable cylinder 28 is braked by a fibre bundle 51 which brushes against the lower end of the rotatable cylinder 28. The fibre bundle 51 is attached to a threaded rod 52 which engages in a fixed nut 53 which is mounted on the side of the case 11.

Also in Figure 1 the rotatable multi-colour disc 36 is braked by a fibre bundle 54 which brushes against the side or boss of the multi-colour disc 36. The fibre bundle 54 is attached to the rod 55 which engages in a fixed nut 56 which is also mounted on the side of case 11.

The water display apparatus 2 also comprises an electrical supply with any switches, controls, transformers, warning lights, waterproof enclosures and panels required.

Referring to Figure 2, an incoming single-phase mains voltage cable 58 enters the lower fixed part of the cabinet from below through a hole (hidden by the water reservoir) in the bottom of the cabinet close to the wall. The mains cable 58 then enters a waterproof box 59 which is secured to the hinged lid 6 of the cabinet. The cable 58 is sufficiently long and flexible to enable the lid to be opened and closed without damaging the cable 58. The waterproof box 59 contains a 12 volt transformer (not visible) and a switch 60 for the light source 16 which is typically a 50 watt 12 volt halogen lamp. The switch 60 may be mounted on one side of the box 59 which is fastened against the inside of the front of the lid 6. The front of the lid 6 has a hole cut in it to reveal and provide access to the side of the box 59 on

which the switch 60 is mounted. This side of box 59 may be treated as a small panel 62 on which to mount switches and lights as required. Thus a warning light 61 to warn when the water level in the water reservoir 3 has fallen to a critical level is also mounted on panel 62. The low level warning light 61 is operated by a low level switch 62 which is mounted on the pump bracket 19. Both the warning light 61 and the low level switch 62 may be in a 12 volt circuit fed from the hidden 12 volt transformer.

The pump 14 may operate on mains voltage supplied from the waterproof box 59. The pump 14 and the cable feeding it are made for operation under-water. The pump circuit may also contain a relay switch in the waterproof box 59 which is also actuated by the low level switch 62. The purpose of this relay switch is to stop the pump 14 when the water level in the reservoir 3 has sunk to such a level that the pump 14 is in danger of being starved of water.

As water will usually have to be supplied via the bowl 4 to the water display apparatus 2 while the lid 6 is closed to make up evaporation and other losses, some means of knowing the water level in the reservoir 3 must be provided. To this end the reservoir 3 may be made from transparent or translucent material and one or more peep holes 64 are provided in the front or side of the cabinet. When the light source 16 is switched on, sufficient light enters the reservoir 3 for the water level in it to be seen.

If deemed necessary an overflow tube leading to a drain may be provided on the side of the reservoir 3 to prevent over-filling when water is added via the bowl 4.

Holes 76 through the back of the fixed part 7 of the cabinet are provided for mounting it on a wall.

To prevent water condensing on and misting the transparent shield 9, ventilation holes (not shown) are provided at the top and bottom of the case 11.

When the water display apparatus 2 is used primarily as an air humidifier, extra ventilation of the air space around the display device 8 is required. This may be provided in several ways including the use of a fan attached to the top of the rotatable cylinder 28 without extra

power supply or the use of an independently driven fan placed near to the water display device.

Before opening the lid 6 of the water display apparatus, for example to change the lamp bulb or alter the shaft angle, the water in the bowl 4 is first drained into the reservoir 3 by lowering the weir tube 13 in its grommet 35. The shield 9 is next removed with its case 11 and the display device 8 and multi-colour disc 36 are also removed. The lid 6 is then swung up and over through 180° when all parts fixed under the bowl 4 rise clear of the water reservoir 3 and are accessible to work on.

It is to be appreciated that the embodiments of the invention described above with reference to the accompanying drawings have been given by way of example only and that modifications may be effected. Thus for example, instead of a four sided cabinet with square corners for wall-mounting, a triangular three-sided cabinet can be designed and employed for corner-mounting. This has the advantage of being less intrusive in a room.

The transparent screen is only needed to protect the display device from damage by children, over-curious adults and vandals. Because the display device 8 is light and rotates slowly it presents no signifiant risk to adults. Thus for many applications the tranparent shield 9 and the case 11 may be dispensed with.

It is not always necessary to mount the water-display apparatus in a cabinet.

The bowl may be directly mounted on a water reservoir of appropriate size and shape, when the water reservoir serves as a base which may stand on a table or shelf or even on the floor.

The water display apparatus can alternatively be mounted in a purpose-made stand, in which the water reservoir and other parts are visible. A wide variety of stands, stand materials and finishes is possible, e.g. short stands for table mounting and taller ones to stand on the floor or ground. The stands may be made of a transparent material such as acrylic or of any other appropriate material.

It also not always essential to employ a water reservoir. If no water reservoir is used, the bowl may be supported on a pedestal with the pump under the bowl so that the water leaving the bowl passes directly to the pump.

If the pump and light source are enclosed, the water leaving the pump may first be arranged to pass through a cooling coil mounted close to the light source and in the enclosure to prevent overheating of the enclosure. The enclosure may be lined with sound insulating material if desired.

It is also possible to employ an elevated water reservoiror or other means of water make-up.

Many modifications to the illumination means are possible. Stationary coloured glass or transparent plastic discs may be placed on the glass disc 48 in the window aperture in the bowl 4. These may be additional to or replace the rotating multi-colour disc 48. Instead of fixing the pin 40 on which the multi-colour disc 48 rotates to one side of the glass disc 48, the pin 40 may be fixed on top of and even at the centre of the glass disc 48.

As well as the means of illumination described above, various alternative means of illumination may be employed. These include illumination from above, the use of lasers, and the use of invisible ultraviolet light and fluorescent materials in the construction of the water display device and in the water itself.

The illumination means is not always required, especially where the main purpose of the apparatus is as an air humidifier. The illumination means may also be dispensed with when the water display device 8 is in a well lit position, especially when it is lit by direct sunlight.

Mirrors may also be used to show the illuminated water display device to best advantage. In the example described above, one or more mirrors may be mounted inside the case 11, or on the wall itself when no case is employed.

Several other forms of bearings and brakes other than the point type thrust bearing and the bush type radial bearing described above may be employed. The only limitations on the

bearings employed are that they should have very low frictional resistance and be rust and corrosion free.

There are few limitations on the size of the water display apparatus 2 other than by the dimensions of the space in which it is to be installed. This type of water display apparatus is primarily intended to be used indoors in a protected environment, where it is not subject to the extremes of weather and the attention of birds and animals.

The water display apparatus 2 is preferably used with softened water to prevent lime deposits or better still with demineralised water to prevent deposits of water soluble salts as well, although the latter are easily washed off. In order to prevent the growth of algae and other micro-organisms, hydrogen peroxide or other suitable biocides may be employed in suitable and appropriate quantities commensurate with the size of the water display apparatus 2.

The water display apparatus 2 is designed to give maximum visual and audile effects during use, with no undesirable splashing of water. The water display apparatus 2 may act as a very efficient air humidifier in heated buildings where low relative humidity in cold weather may cause respiratory problems and damage to wooden furniture.

The helical arrangement 10 may be such that that it employs a left hand or right hand thread arrangement. A multi-start arrangement may also be employed with two or more coaxial fins.

The water display arrangement of the present invention may be sold under the trade mark THE TWIRLPOOL.

CLAIMS

1. Water display apparatus comprising one or two containers for water and a rotatable water display device which is mounted on a stationary shaft which is inclined to the vertical, the display device being such that it extends upwardly from the bowl at an angle to the vertical, the display device comprising a helical arrangement having a plurality of concave portions, pump means and illumination means for illuminating the display device, the water display apparatus being such that in use the pump means pumps water to the top part of the display device from where the water is able to run down the helical arrangement, and the water display device being such that in use the display device is caused to rotate by the water running down the helical arrangement.

2. Water display apparatus according to claim 1 in which the helical arrangement is a helical fin arrangement.

3. Water display apparatus according to claim 2 in which the fins on the helical fin arrangement are transparent.

4. Water display apparatus according to any one of the preceding claims in which the helical arrangement tapers from a central portion towards both of its ends.

5. Water display apparatus according to any one of the preceding claims in which the display device is inclined with its central axis at an angle of 8-45° to the vertical.

6. Water display apparatus according to claim 5 in which the display device is inclined with its central axis at an angle of 10-20° to the vertical.

7. Water display apparatus in which the display device includes a rotatable cylinder from which the helical arrangement extends, a non-rotatable shaft which is mounted in the base of the bowl and which extends through the bowl and through the cylinder, and bearing means for mounting the cylinder on the shaft such that the cylinder and display device of which it forms a part are free to rotate.

8. Water display apparatus according to claim 7 in which the non-rotatable shaft is a hollow supporting

shaft through which the water is pumped to the top part of the display device.

9. Water display apparatus according to claim 7 or claim 8 in which the non-rotatable shaft is a transparent non-rotatable shaft.

10. Water display apparatus according to any one of claims 7 - 9 and including a means for occasionally adjusting the angle of the non-rotatable shaft to the vertical.

11. Water display apparatus according to any one of claims 7 - 10 in which the bearing means comprises a point bearing attached to the upper end portion of the non-rotatable shaft, and a bush bearing at the lower end portion of the non-rotatable shaft.

12. Water display apparatus according to any one of the preceding claims in which the illumination means comprises a light source plus a plurality of differently coloured light filters.

13. Water display apparatus according to claim 12 in which the differently coloured light filters are incorporated in a multi-colour disc each in a separate area of the disc.

14. Water display apparatus according to claim 13 in which the multi-colour disc is so arranged that it is free to rotate underwater in a horizontal plane during use of the water display apparatus.

15. Water display apparatus according to claim 14 in which the multi-colour disc is caused to rotate during use of the water display apparatus by a submerged jet of water so directed as to impinge tangentially on the outer edge of the multi-colour disc.

16. Water display apparatus according to any one of the preceding claims in which a light source of the illumination means is mounted below the bowl and shines upward on to the water display device through a transparent window sealed in the base of the bowl.

17. Water display apparatus according to claim 13 or claim 14 in which the water display device is provided with brake means to limit and control the speeds of rotation of both the water display device and of the multi-colour disc.

18. Water display apparatus according to any one of the preceding claims and including automatic water make-up means to replace water lost through evaporation and the like.

19. Water display apparatus according to claim 18 in which the automatic water make-up means comprises a water reservoir below the bowl and a constant level device in the bowl consisting of an adjustable weir tube.

20. Water display apparatus substantially as herein described with reference to the accompanying drawings.

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Relevant Technical Fields (i) UK Cl (Ed.N) FIX (X1) (ii) Int Cl (Ed.6) B05B 17/08	Search Examiner B W DENTON Date of completion of Search 20 JULY 1995
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ONLINE: WPI	Documents considered relevant following a search in respect of Claims :- 1-20

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